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MECHANISM VERSUS VITALISM AS A PHILOSOPHICAL ISSUE

THE issue[1] raised between the vitalist and the physicochemical mechanist is evidently one that cannot be fully met until the experimentalist secures all the relevant evidence. When this complete evidence will have been secured or that it ever will be secured, of course no one knows. In the meantime we witness two distinct controversies, the one properly engaged in only by experts in physiology, biochemistry, experimental zoölogy and botany, and psychology, the other properly engaged in by any philosophically minded student. In the former controversy the participants set forth the phenomena and properties of living things, examine the hypotheses offered as solutions of problems thereby raised and the evidence on which these hypotheses rest, and weigh the probability that admittedly unsolved problems may in the future be solved by analogous hypotheses. Here the biological expert alone deserves a hearing; and the only part of this field in which I might venture to offer opinions is psychology. However, as even a brief survey of the psychological evidence would require all of my allotted time, I am leaving to my colleague, Professor Warren, the responsibility of presenting the issue between vitalism and mechanism within psychology, and I shall confine my paper to this issue studied only as a philosophical controversy.

Here again I wish to limit my paper. As I have completely lost faith in every form of rationalism and transcendentalism, I must leave to those who retain such a faith all serious study of any *a priori* method of meeting the issue between vitalism and mechanism. Thus limited, the issue as a philosophical controversy has remaining at least three aspects. First, the issue needs to be defined and the rival hypotheses need to be made thoroughly explicit. This task belongs properly to the metaphysician, or logical analyst. Second, the issue is an eddy in the main current of modern European intellectual development and should be studied from the point of view of the historian of philosophy. Third, the issue involves only a part of man's universe of study and discourse and in this sense is abstract. Hence if there can be such a study as that of the concrete total, or universe, then the vitalist and the mechanist must give a hearing also to the student who endeavors to view the problem of life from the standpoint of the concrete total. I shall confine my paper to the two former aspects, the logical and the historical, and leave to my colleague, Professor Hoernlé, any discussion that may be based upon the third study, or that made from the point of view of the concrete total.

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[1] If I interpret correctly our 'Basis of Reference' (*J. of Phil., Psychol.*, etc., Aug. 15, 1918, pp. 460–461) vitalism is to be distinguished from mechanism not by some principles *merely additive* to physicochemistry but by principles that *contradict* physicochemistry. For example, it was the belief of at least a few of the leaders in this discussion that Driesch holds that some vital phenomena contradict the second law of thermodynamics. Accordingly, in this paper I include within mechanism not merely the doctrine that physicochemistry is sufficient to explain life, but also the (neutral, if you prefer) doctrine that merely additive principles may be required; whereas by vitalism I mean any doctrine which teaches that life presupposes entities, agents, or principles which contradict physicochemical mechanism as defined in our 'Basis of Reference.'

Studied from the point of view of the metaphysician, the problems raised in the issue between mechanism and vitalism are no new ones; for they have been prominent in the thought of the past three centuries. At the one extreme is the belief that the universe is logically continuous, is fundamentally a mathematical world; and at the other extreme is the belief that the universe is alogical and can best be described in such prescientific language as that of the layman, the poet, and the animist. That is to say, the issue represents two radically different philosophies, that of modern science and that of modern romanticism.

The philosophy of modern science is manifested in the holding of the following scientific attitudes or principles. First, determinism. This principle asserts that all facts or phenomena can be explained or accounted for, or are conditioned. Two different events presuppose different conditions and these conditions are discoverable. In short, facts can be deduced. Second is the principle of analysis. This asserts that the complex can be analyzed into the relatively simpler and the structure, or way in which this 'simpler' is organized to make the complex. Third is the principle of simplicity, or paucity. This asserts that the ultimate simples and the ultimate premises upon which explanation, or deduction, rests are relatively few and that science should endeavor to discover their minimum. Fourth is the principle of independence. This asserts that the ultimates of explanation are logically independent, that is, one does not presuppose the others. From these principles follows what is well called the logical continuity of science *as an ideal.* The special sciences tend to order themselves as logically prior or posterior; and as science progresses, we approach as a limit one deductive science in which all the special sciences or bodies of explanation follow from logically prior sciences and these ultimately from mathematical sciences. In short, at the limit there is but one type of explanation and this is mathematical.

Within this larger philosophical creed the part to be included within biological mechanism is evident. All mechanists believe that whatever life may prove to be, no vital phenomena will be found to be inconsistent with physicochemistry; and the extreme mechanist believes that the phenomena both of life and of mind will in time prove to be *fully* explicable in terms of this logically prior science. All believe at least that it is the business of the biologist and psychologist to explain the phenomena studied by them physicochemically *as far as they can.* The extreme position is held, if I mistake not, by Loeb. Of the mechanists who are scientifically less optimistic, some find in mind and others find in both life and mind, that which is logically discontinuous with physicochemical mechanism. The English physiologist Noel Paton holds, I believe, the former position and the English biochemist Benjamin Moore the latter position. According to the former (widely held) position, mind is not inconsistent with the physicochemical but is additive. It may be merely a series of epiphenomena in one to one correspondence with the physiological or it may be a genuinely novel agent, organization, or energy. According to the latter position, life also may be more than the physicochemical. There may be a genuinely new energy, *a vital energy*. This energy, if I understand Moore correctly, is comparable to molecular energy in that it cannot be exhibited by entities of lower complexity and in that it is the consequence of organization of a higher order. I find at least three distinct and fundamental doctrines held implicitly among these moderate and more numerous mechanists. First, there are facts or phenomena that are non-mechanical but are in one to one correspondence with the mechanical and are to be explained through the configurations with which they correspond. Such a doctrine is held widely among psychologists and is a double-aspect theory. Second, organization exhibits new properties, properties that cannot be deduced from the properties exhibited by the relatively simpler structures that are members of the organization. This view seems to me to be held by Moore. Third, life reveals the presence of new principles or new energies that are logically independent of the properties or energies present in the lifeless. The former properties or energies are, however, not inconsistent with the latter, for they are merely additive. This last doctrine seems to me to be held explicitly in Ostwald's suggestion of a 'psychic energy.'

Though there are evident compromises with vitalism in these moderate mechanistic doctrines, still they all are purely additive to physicochemical mechanism; and they all hold out the possibility of explaining life. They all are deterministic. They all in these two senses believe that science can win in the long run.

In contrast, vitalism, as defined in our 'Basis of Reference,' limits the extent to which the universe of fact, or observable data, can be explained. The extreme romanticist, who as such is a vitalist, tells us that nothing can be explained. It can only be intuited. Or he tells us that only the spatial can be explained; for science is but mathematics, and mathematics, he adds, is a study only of the spatial. The moderate romanticist—the vitalist especially, with whom we are concerned—finds in life, or at least in certain aspects of life, facts that are inconsistent with physicochemical mechanism; and these facts defy explanation, that is, they are indeterministic. Different vitalists of course differ as to the types of facts they enter upon this list. Perhaps the two sets of facts that are most prominently regarded as indeterministic are the unity or regulation of the organism as a whole, and the teleological or purposeful aspect of vital phenomena. These at least are alogical; and therefore here at least science must forever fail. In place of explanations we are offered terms and propositions that defy further logical analysis. Either they are the mere contradictions of the terms and principles of science, or they are the foreign terms and propositions of prescience. At the best the latter can be intuited or can be described figuratively. Without intending any offense, I must confess that I find these terms and propositions to be of the same type as those of primitive magic and animism. Indeed, vitalism is either an explicit or implicit animism, as the vitalistic psychologist MacDougall most consistently shows.

Now if the history of science reveals anything, it manifests that science became science by outgrowing animism. Science and animism are contradictories. So are science and vitalism the moment the vitalist offers 'an explanation of life.' However, it may be claimed that only rationalism would rule out animism as a possible scientific hypothesis; for if the facts call for this hypothesis, why should not the experimentalist accept animism gracefully? Why slander the open-minded scientist because he is an empiricist? How can we decide *a priori* that animism cannot be true? My reply is twofold. First, of course animism may be true; at least I am not questioning its being true. Certainly there is no *a priori* proof that it is false, or even that nature is not alogical. Second, and this is my only point, animism is not a scientific hypothesis; for animism is not additive to physicochemical mechanism but contradicts it. Nay more, animism asserts that in part nature cannot be explained scientifically, that nature is in part inexplicable. Animism is fundamentally indeterministic; whereas explanation presupposes determinism. In short, animism is not an explanation; for when critically examined, it proves to deny the possibility of explanation.

Here some may protest: "Some animists are explicitly determinists. They assert merely the existence of an entity with powers other than those studied in mechanics, physics, and chemistry. Souls may behave as uniformly as do atoms and may lend themselves to experimental enquiry as readily as do bodies." To such protestants I reply: Let us not quarrel about words. Such animism is not the historic doctrine, nor is it the animism of the vitalist. An animism that does not contradict physicochemical mechanism but is merely additive, and that asserts the existence of an entity which lends itself to experimental enquiry, or is deterministic, seems to me to assert nothing more than an unknown X, which if known, would explain life. It lacks any positive hypothesis over and above the pointing out of the novelty and uniqueness of life and mind. It is merely the denial of the sufficiency of physicochemical mechanism. It is not the animism of MacDougall; nor is the soul whose existence it asserts, the entelechy of Driesch.

But some may still object: "You do not say what animism *is*; for your description is merely negative." I admit the point and even add, I do not know what animism *is*. Animism defies logical analysis except in negative terms. Of course we are told what a soul does; but we are told also what magic does and what fairies do. The best that I can do in defining such entities is to call them indefinables, or to call them things that can be defined only by negation, or possibly to call them things of which contradictory attributes are asserted. To the logical analyst souls seem round squares. They are complex yet simple. They have structure but remain unities. They are wholes without parts. They are creative agents but need no fuel; for they bring about changes in the physical world merely by their *fiat*. If they explain anything, then I fail to see why they do not explain everything. They belong to the alogical universe so admirably pointed out to us in our generation by the romanticist Bergson, a universe that he shows us is open only to our intuition.

Let us here turn from logical analysis and view vitalism and mechanism as related to major movements in contemporary thought, examining especially the motives behind these rival doctrines. If the preceding analysis has been correct, the issue between vitalism and physicochemical mechanism is part of a larger conflict taking place throughout the entire history of European thought and in particular of modern thought. It is part of the struggle between modern intellectualism and modern romanticism. It is not merely a difference of opinion arising between two judicial biologists examining facts and weighing evidence; for it is also a difference in religion, or emotional attitude.[1] In short, each intellect betrays the presence of 'a Freudian wish.' The mechanist *hopes* that science will win. The vitalist *hopes* that science will fail. And this is true though both men are numbered among scientists. The wish is father to their thought.

The different consequences of these rival wishes are momentous in the emotional life of man. If science wins, the world will prove to be one in which man is thrown entirely upon his own resources and skill, upon his self-control, courage, and strength, and perhaps upon his ability to be happy by adjusting himself to pitiless fact. If science fails, there is room for the childlike hope that unseen powers may come to the relief of human weakness. If science wins, the world is the necessary consequences of logically related facts, and man's enterprise, in Huxley's figure of speech, is the playing of a game of chess against an opponent who himself never errs and never overlooks our errors. If science fails, the world resembles fairyland, as matter of great anthropological and psychological importance; and man's enterprise either is no longer a task for skill and knowledge or is conditioned by the 'goodness' of man's will or is in part a game of luck. Historically considered, the wish behind the belief in the victory of science is the motive prominently manifested in civilization in general, and in particular in vigorous, progressive, and youthful periods of history; whereas the wish behind the belief in the defeat of science is the motive markedly manifested in a people's childhood and old age, in general in savagedom and in periods of decadence or defeat. Psychologically considered, the wish behind the former belief is a symptom of vigor, independence, and mastery; whereas the wish behind the latter belief is a symptom of weakness, fatigue, dependence, waywardness, and failure.

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[1] I find the words of Loeb in the preface of his book, *The Organism as a Whole*, especially apt: "The book is dedicated to that group of freethinkers, including d'Alembert, Diderot, Holbach, and Voltaire, who first dared to follow the consequences of a mechanistic science—incomplete as it then was—to the rules of human conduct and who thereby laid the foundation of that spirit of tolerance, justice, and gentleness which was the hope of our civilization until it was buried under the wave of homicidal emotion which has swept through the world."

But am I right in finding 'a Freudian wish' behind vitalism which connects vitalism at once with romanticism, or is my assertion of this connection a gross exaggeration? In a sense it is of course an exaggeration; for no civilized man is so much a romanticist that he is never an intellectualist and no intellectualist fails at times to be a romanticist. And what is true of men is true also of man, or the great historical movements. In modern thought the two movements or tendencies are to be found interfused in numerous proportions. Still we are justified in dividing men into romanticists and intellectualists; and we are justified in connecting vitalism with the romantic tendency. At least all romanticists are vitalists. Moreover, a psychologist cannot read a markedly vitalistic or a markedly mechanistic book without detecting on the one hand the complete absence of regret on the part of the vitalist that if his vitalism be true, science cannot explain life, and on the other hand, the desire of the mechanist that science should win. Compare, for example, Driesch and Loeb. No one can call them neutrals examining a body of evidence.

Consider further what may be called *the impatience of vitalism.* All admit that the study of vital phenomena reveals everywhere unsolved problems; but the vitalist seems to forget that the past one hundred years have had a marvelous record of physiological and biochemical victories. Again, the vitalist seems to neglect the truth that whatever life may prove to be, part of the seeming failure of science is certainly due to the fact that life has proved to be vastly more complex than the biologists even of a generation ago believed it to be. For example, the vitalist seems completely to neglect the fact, as Professor Henderson has pointed out, that we are still ignorant of the physicochemical structure of the living cell and that until we do know this structure no one can know how far physicochemistry can or cannot explain life. If the ambitious hopes of earlier days have proved absurd, this is not due to an inability of science to progress; for science has progressed beyond even the dreams of our fathers. Rather it is due to the immense but unknown complexity of nature. What then would be the reaction of one of a judicious mind toward our present obstacles and failures and toward our vast ignorance? Would he not reserve judgment, admitting our ignorance and difficulties but at the same time urging the experimentalist to keep trying? Would he admit the failure of science and urge a rival anti-scientific hypothesis? The answer seems to me evident: we are not dealing with a judicial mind.

Here at once the advocate of the vitalist will protest that my question is unfair. It is not because of our ignorance and failures that the vitalist is ready to admit the permanent failure of science, but because we have positive evidence that science must fail. We have positive evidence that life contradicts the physicochemical; for *it is inconceivable that a machine can do what life does.* Now it is not my purpose to examine the evidence here in question, for that would require an expert biologist; but I do wish to examine this protest as a logician and a psychologist.

The argument from the inconceivable is utterly fallacious; for it is really only an argument from ignorance. That machines, as we know them, should do things inconsistent with their properties is indeed inconceivable; for it contradicts a mere truism. But nothing can be inferred regarding physicochemical machines as we do not know them; for whether or not there are such machines and what they can or cannot do—all this remains to be discovered. Is the living cell merely a physicochemical machine? We do not know. If it is merely a machine, what can or cannot this machine do? We do not know; for never have we observed mechanism of such complexity. We are, as it were, savages disputing regarding the nature of a thunder shower. The chemistry the vitalist pronounces inadequate to explain life, is of course the chemistry we know. From all of which nothing follows regarding the chemistry which we do not know. Again, it is urged, that a homogeneous entity should of itself undergo differentiation is inconceivable. True, but it is certainly an open question whether or not the ovum is such a homogeneous entity. At best we are ignorant.[1] Finally, it is urged that it is inconceivable that a machine should have two or more different lines of action open to it at the same instant. Of course it is inconceivable, if the very definition of a machine makes it a contradiction in terms. But do we know regulation, regeneration, and similar vital processes well enough to prove that they are truly comparable to the behavior of this inconceivable machine? We do not.[2] In short, the argument from the inconceivable reduces to some such statement as this: If the living organism is a mere chemist, it is a vastly better chemist than we are. Limited to our present practical chemistry, its deeds seem miraculous.

But philosophically this argument from the inconceivable has another fallacy; for the vitalist who pronounces life an inconceivable physicochemical process, and therefore scientifically inexplicable, offers himself at once an inconceivable explanation. By mere definition he gives us a miracle-worker; but surely such a definition does not make miracles conceivable. In short, he does not object to the inconceivable as such. What then is he really trying to prove? That life is really inexplicable, that it can be observed, but that it cannot be understood. He is a romanticist.

Vitalism as a positive doctrine and vitalism even as a mere negative doctrine are interesting also psychologically. Animism is clearly 'a call of the wild'; and agnosticism also has been a notorious aid to faith by making room for the will to assume primacy over the intellect. That is to say, the very fact that the vitalist does more than reserve his judgment is psychologically suspicious. It is evidence not merely that he does not want science to succeed but also that he wants something positive. He wants life to be genuinely creative, that is, to possess powers which are inconsistent with the principles of physical science.

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[1] But Professor Conklin and others are showing that the cytoplasm of this cell is already differentiated into zones that are to become different parts of the embryo. In short, the ovum is already the embryo. *Cf.* Loeb, *The Organism as a Whole*, pp. 128 f.

[2] For example, regeneration instead of being an assumption of a new line of action on the part of living tissue may prove to be merely an old line of action heretofore inhibited but now freed from the inhibitor.

He wants life to be indeterministic and mysterious. He wants the world to contain creative teleological agents; for such a world seems more in tune with the heart of man. In short, he wants the religion of romanticism.

In contrast, the mechanist also has a religion, but a different religion. He wants the world to prove simple, explicable, and manageable. He wants man to be lord of creation and master of his destiny. He wants man to be self-sufficient, self-controlled, and morally the ultimate jury. For him, man's supreme enterprise is civilization, justice, and enlightenment.

If the foregoing analysis of the two rival hypotheses is correct, we now face the question: Which is true? Can philosophy answer? I believe it cannot. The ultimate test of truth and right is not logic or argument, but fact or perception. The most that philosophy as a scientific pursuit can do, is to lay bare or make explicit the dogmas, hypotheses, terms, and inferences of men. It cannot give them their sciences, their morals, or their religion. With Fichte, I would say that a man's philosophy depends upon what sort of a man he is; for at bottom argument depends upon a willingness to conform to certain rules and to adopt certain premises and the adoption of these rules and premises must precede the argument. In short, the controversy between physicochemical mechanism and vitalism is not one regarding facts, or observed data calling for scientific explanation, but is one regarding rival philosophies. And the destiny of these rival philosophies the future alone can reveal; for the past reveals them only as rivals.

What, however, the philosopher, the historian, and the psychologist can discuss, is the consequences of the rival philosophies if consistently carried out in action. That is, we can meet the issue pragmatically. If we state what we want, these students can help us to choose our philosophy. If we want civilization, if we want man to depend upon his skill rather than upon hypnosis, we must encourage him to try to understand his environment and himself and to learn how to control himself and his environment. If we want enlightenment we must encourage experimental research and the belief in determinism which it presupposes, we must encourage men to believe in a logical world.

If we want man to be master of his destiny, we must preach the religion of effort, and of self-confidence. However, if we want the life of the vagabond, the adventurer, or the quitter, or if we want peace and rest; then we need a philosophy which leaves open as a credible religion that of animism, magic, and hypnosis.

To stop here would be doing romanticism and vitalism a gross philosophical injustice; for there are other wants, wants possessed even by extreme intellectualists. From the point of view of these wants, intellectualism has its dangers and romanticism has a most valuable protective influence. Intellectualism is liable to the faults of youth and adolescence. It is liable to be overconfident and even arrogant. It is liable to be doctrinaire, to be satisfied with a simple solution of complex problems; whereas complex problems require complex solutions. It is liable to become a dogmatic rationalism and to forget its own inductive and experimental origin. It is liable to forget that fatigue and old age are facts and that as facts they too have the right to be heard as witnesses. Finally, it is liable to forget that even science admits the possibility or even probability of the ultimate failure of civilization and of man's other enterprises, that all that the heart of man desires may not be obtainable through human skill, that man's powers are limited and that nature may prove to be too refractory. In particular, against the mechanist's liability to rationalism vitalism is a corrective because of its empiricism. It keeps pointing out new facts, new problems, and new difficulties. In so doing, it seems to me, that vitalism has already been of marked help to biological science; for it has turned the attention of the biologist to presuppositions in his theories which he was overlooking. Again vitalism protests against the tendency to over-simplify, a tendency present throughout the history of science. Whatever life may be, it is far more complex than it used to be thought to be. Here too I believe that vitalism has been a most valuable check to the self-confident mechanist. Finally, vitalism is a protest against the tendency to minimize the teleological that as mere fact is present in life, no matter how it is to be defined and explained.

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